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THE STRUCTURE OF AUSTRIA-HUNGARY.

Bau und Bild Österreichs. By Carl Diener, Rudolf Hoernes, Franz E. Suess, and Victor Uhlig. Pp. xxiv+1110. (Vienna: F. Tempsky; Leipzig: G. Freytag, 1903.) Price 78 kronen, or 65 marks.

THE publication of this elaborate and serious work implies a high regard for scientific education in the countries for which it is immediately intended. It is not a popular correlation of the scenic and geological features of the Austro-Hungarian Empire, such as would appeal to the ordinary traveller; and yet, now that it has appeared, we feel that no one can properly understand the regions dealt with until he has consulted this treatise, and thus brought himself abreast with current views. We recently had occasion to notice (*NATURE*, vol. lxxviii. p. 550) the admirable series of brochures prepared in Vienna for the Geological Congress of 1903. The Bosnian guide then foreshadowed has since appeared, and sums up a surprising amount of recent observations made in the occupied provinces. But these publications do not detract from the value of the great work now before us, which is essentially a book for the library, clear, readable, and stimulating. Its reviews of successive opinions on this or that controverted area are of considerable mental value, and the authors state their own conclusions with a display of argument and reasoning that is rare in works of reference. As in a good deal of Austrian writing, the human man, scaling the hillside, or watching the great rivers swirling through the plains, is apparent through the topographical and geological details; and even the pages on petrography, when thus led up to, have an impression of the open air.

Prof. Eduard Suess contributes an introduction, in which he relates the growth of geological observation in the empire, from the mining operations of the sixteenth century to Partsch and Haidinger in 1850. The Bohemian region is then dealt with by Franz E. Suess in 322 pages, accompanied by landscape-illustrations that convey much of the character of the country. We thus see the white quarry on the Schlossberg of Brück, the pastures of Eisenstein under the forest-rim, and one of the great black open workings of the brown-coal area in the north. The author shows well how the Bohemian region spreads beyond political Bohemia, and that, while watersheds divide nations, the boundaries of hill and plain define geological areas. If we reach Eisenstein, for example, we must go forward and make the plunge through the Bavarian forest to the Danube; on the other hand, the easy undulating country beyond Habern leads us inevitably to inquire into the structure of Moravia. While the great Bohemian "horst" is part of a range that arose during the movements of Middle Carboniferous times, its fundamental rocks are largely pre-Cambrian. The central granites have penetrated these gneisses and phyllites at a period which may be later (p. 56) than the Ordovician, and have profoundly modified and intermingled with the gneisses. The schists, on the other hand, possibly through their having been nearer

the surface at the time of the intrusion, show a fairly sharp line of contact. Similar phyllites appear in Moravia in the cores of gneissic anticlinals, reversing the usual relations of such masses. Unless thrust-planes can be called in, it is clear that this region offers much room for speculation. Dr. F. E. Suess (p. 76) urges that considerable movements took place in Moravia before the great bow of old rocks, stretching from the Sudetic to central France, was folded and upheaved in the Carboniferous period. This is rendered likely by the antiquity of the rocks themselves, and is supported by the occurrence (p. 114) of pebbles of the early gneisses and amphibolites in pre-Cambrian conglomerates near Příbram.

The famous question of Barrande's "colonies" is dealt with historically and succinctly (p. 141). Among other interesting details, we can only refer to the evidence for the existence of central European deserts in Permian times; to the almost complete absence of marine Mesozoic deposits from Bohemia until the entry of the amazingly world-wide Cenomanian sea (p. 166); and to the comparatively recent origin of some of the ore-deposits in the Erzgebirge (p. 243). An excellent coloured map concludes this section.

Dr. C. Diener then enters on his difficult task of describing the Eastern Alps and the Dinaric Karst. He traces the central zone from the Swiss border, until it breaks off against the incurving areas of subsidence on the fringe of the Pannonian plain. The gneissic axis of northern Styria alone survives, and connects the Alps below Vienna with the Karpethians. While the author's debt to Prof. E. Suess is manifest and acknowledged, he feels bound to join those critics who regard the Alps as resulting from lateral thrusts in two opposite directions, instead of from a one-sided action (pp. 637 and 641). He is unable to recognise, either from the lie of the folds or from the curve of the whole chain, the outer from the inner side of a mountain system. The Dinaric folds thus present their concave side to the Servian mass against which they have been pressed, while the area of subsidence occupied by the Adriatic lies on the concave side of the Alps and on the convex side of the Dinaric system. Very many geologists will agree with Dr. Diener when he says of the southern Alps,

"Hebung, nicht Senkung, ist also hier der Effekt der Zusammenfaltung gewesen. Eine wirkliche Senkung hat nur bei dem jüngeren Einbruch des Adrialandes stattgefunden" (p. 638).

The remarkably late origin of the Adriatic subsidence is emphasised on pp. 607 and 629, the alluvial sands of southern Istria being probably involved, and the movements being certainly post-Pliocene. The Alps, on the other hand, are regarded as having remained stationary at this epoch, in opposition to the views of Dr. Heim.

The island-like masses of folded rocks that rise, as a welcome feature, above the lower Sava plain are once more regarded as the partially buried spurs of the eastern Alps (p. 566), and not as portions of an older system. Dr. Diener finds himself also opposed to the torsional views of Mrs. Ogilvie-Gordon in re-

gard to the huge blocks of dolomite in Tyrol (p. 548), and believes that these weighty masses have sunk down amid the yielding tuffs and sediments deposited upon their flanks. The reef problem is dealt with cautiously (p. 541, &c.), and the term "reef" is used, following Prof. Suess, as the equivalent of "massive unstratified limestones and dolomites," rising amid strikingly contrasted sediments. It is unfortunate that the latest evidence brought forward by Mrs. Ogilvie-Gordon as to the age of the igneous intrusions round Predazzo was published too recently to receive adequate notice in this volume, though her arguments and those of Rothpletz are briefly mentioned.

For those who desire a general history of the Alps, adorned with modern references, we may commend the whole seventh "Abschnitt" (pp. 589-610) as a clear and even spirited summary. The discussion of mountain-structure that follows shows the independence and vitality of the school which Suess has founded in Vienna, a school of progressive inquiry unhampered by dogmas, active in unearthing problems, but willing to wait for explanations.

Dr. V. Uhlig is given 260 pages for the exposition of the Karpathian lands, and occupies them with admirable clearness. Like his predecessor, he balances arguments, and states his own conclusions with the modesty of a true explorer. This is particularly noticeable (p. 904, &c.) in his account of the origin of the central *massif* of the Karpathians, which he regards as pushed up by pressure from all sides into and partly through its former Mesozoic covering. One-sided tangential movement will not, in his opinion, in any way satisfy the facts observed (p. 910).

The illustrations and sections accompanying Dr. Uhlig's descriptions are more than usually attractive. We see patches of Eocene conglomerate resting on the central granite of the Tatra, and crystalline schists, on the other hand, thrust up over Neocomian limestone at Bárát Lehota, and sending off dyke-like tongues into the cracks opened in the latter. The fascinating question of the "Klippenzone," referred to by us in a previous review, receives full treatment. The beautiful landscape on p. 771 recalls many of the deep wooded valleys, among sheer limestone cones, which intersect the frontier lands of Arva. The tempting theory that the "Klippen" float as detached fault-blocks amid the softer Flysch deposits is set aside (pp. 791-4), in face of the banks of Upper Cretaceous conglomerate worn from them, and found so repeatedly against their flanks. Examples of these occur from the west end of the chain down to Transylvania (p. 809).

The great Flysch or Karpathian Sandstone series has yielded foraminifera in places, but is otherwise singularly devoid of organisms. Zuber has aptly compared it with the huge delta deposits of the Orinoco. Rock-salt and mineral oil characterise the Miocene horizons in Galicia, and Dr. Uhlig (p. 864) accepts an unconformity between these and the Karpathian Sandstone. He then shows how the present broken condition of the salt-beds may be due to post-Miocene earth-movements.

The important volcanic zone on the inner side of the mountain-ring raises again (p. 879) the question of the relations of the igneous rocks at Selmeczbánya. Prof. J. W. (not "C. W.") Judd is quoted, and the existence of a great central volcano is left as a possible solution. It is pleasant to find a photograph of the lofty obsidian cliff of Geletnek among others of this picturesque area. The rich ore-deposits of northern Hungary occupy cracks in the Miocene lavas, and are among the latest manifestations of the solfatara stage of the eruptions. While the Mesozoic rocks of the Karpathians were folded in early Eocene times, the volcanic outbreak can only be connected with the slighter post-Miocene movements, and appears to have accompanied the general sinking of the lowland.

We cannot do full justice, in concluding this notice, to Dr. Rudolf Hoernes's section on the plains. The Cainozoic history of the empire is involved in that of these great wind-swept level lands. We are taken from the basin of Vienna, which is really an area of depression formed within the body of the Alps, to the sandy reaches on the edge of the Government of Warsaw, where soil and vegetation have difficulty in clinging to the surface (p. 1049). The salt-beds of Wieliczka (p. 942) again come in for treatment, since the separate publication of the four divisions of the volume renders some overlapping unavoidable.

The ravine of the Danube east of Passau, already touched on picturesquely by Dr. F. E. Suess (p. 105), receives full discussion here after an interval of a thousand pages. Following Penck, the general conclusion is that the Danube flowed in pre-Glacial times over the detrital deposits of late Cainozoic age, cutting broad valleys in these, and ravines where it reached down to the underlying ancient rocks. The present prominence of the latter rocks is due to the denudation of the more yielding Cainozoic strata.

Of the four authors, Dr. F. E. Suess perhaps best realises the landscapes in his word-pictures; but the whole book has a literary value, and is thus all the more competent to stimulate observation and research. Its modernised spelling, such as "Zentralkern" and "Gneise," is perhaps a sign of its virility. The absence of an index will surely soon be rectified.

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A NEW FRENCH TREATISE ON CHEMISTRY.

Traité de Chimie Minérale. Published under the direction of Henri Moissan, with many collaborators. Tome Premier—Métalloïdes; Tome Troisième—Métaux. Pp. xiii+527 and 672. (Paris: Masson et Cie., 1904.) Price 125 francs net.

THE recent advance in inorganic chemistry, to which M. Moissan has in no small degree contributed, has rendered it advisable, in his opinion and in that of his co-workers, to take stock, so that those engaged in research in that branch of chemistry may have in an accessible form an account of the whole field and a full bibliography of published memoirs. It is the laudable ambition of the editor to point out what gaps still remain unfilled, and where research may most profitably be undertaken. The atomic theory is